

The 10 to 5 repeated jump test: A new test for evaluation of lower body reactive strength

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Key words:

Stretch-shortening cycle, reliability, validity, sensitivity

Background

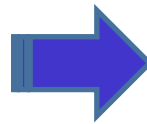
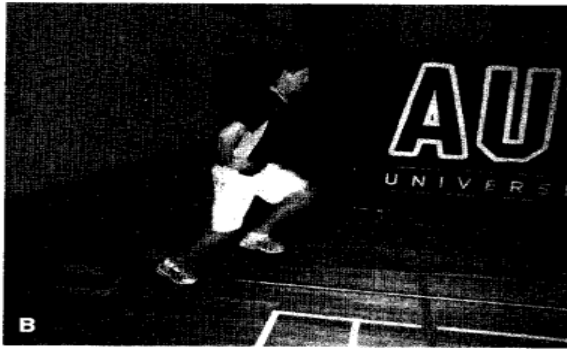
- **Reactive Strength** can be defined as the ability to change quickly from an eccentric to concentric contraction (Young, 1995).
- Must employ a **fast stretch shortening cycle (SSC)** classified as ground contact time of less than 0.25seconds (Schmidtbleicher, 1992).
- Array of jump tests recently proposed to assess this function including: Vertical DJ (Flanagan *et al.*, 2008; Walsh *et al.*, 2004), Single Leg Horizontal DJ (Holm *et al.*, 2008; Simpson & Cronin, 2006; Stalboom *et al.*, 2007), Vertical rebound (VR)10 secs (Chelly & Denis, 2000), VR 5 reps (Lloyd *et al.*, 2009), VR 15 reps (Hobara, 2011) .



Background



- Authors claim that tests provide better **face validity** to high speed movements (Holm *et al.*, 2008).



- **However**, Young (1995) raises concern regards their ability to determine which specific quality has influenced improvements.
- Lloyd *et al.* (2009) used a maximal repeated hopping test suggesting provided **better representation** of SSC. **But**, sensitivity of this assessment was questionable (average CV = 15%).



Methodology (Simpson and Cronin, 2006).

Part 1: Absolute Reliability (CV) and criterion validity

- Seven male college academy level rugby league players (age 17.4 ± 0.6 years; body mass 81.6 ± 16.3 kg; height 175 ± 5.2 cm; mean \pm s).

Part 2: Relative Reliability (ICC; test-retest)

- Sixteen male Super League rugby league players (age, 19.7 ± 0.8 years; body mass 88.5 ± 12.0 kg; height 177.3 ± 6.1 m; mean \pm s).

Reduce time burden associated with working with elite athletes (Reilly *et al.*, 2009).



Methodology

PLEASE CLICK THIS LOGO

smartjump

- All jumps were performed on a mobile contact mat (Smart-jump, Fusion Sport, Australia).
- Contact time $< 0.25s$ (Schmidtbleicher, 1992).

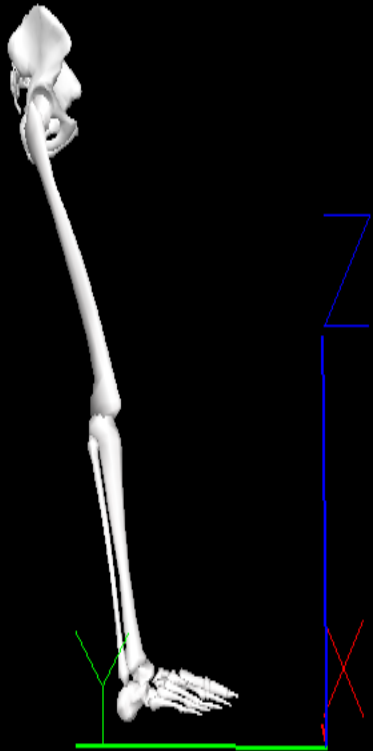


Methodology

- Mobile contact mat was positioned directly over a 400 x 600 mm ground-fixed force plate (type 9281CA, Kistler Instruments, Alton, England) sampling at 500Hz (part 1 of study).
- **Part 1** - Five trials.
- **Part 2** - Two trials (determined from part 1) on each testing session separated by one week.
- 1 minute rest provided between successive trials.



Methodology (protocol 10 to 5RIT)



Results

Absolute Reliability

Table I. Means, SD and CV for jump heights across 5 trials.

Subject	1	2	3	4	5	6	7	Mean	% Change in Mean
<i>Trial</i>									
2	131.43	115.14	187.44	109.87	145.21	113.35	104.07	129.50	11.55
3	129.53	125.33	184.01	116.45	133.92	128.02	103.05	131.47	1.08
4	111.7	120.18	198	133.79	139.99	122.51	105.83	133.14	1.25
5	129.77	106.67	179.06	144.35	141.86	122.89	110.44	133.58	0.33
Mean	126.33	112.17	185.44	120.20	136.58	117.08	101.34	128.446	
SD	8.22	12.49	7.91	19.04	9.16	11.60	10.46	11.3	
CV %	6.5	11.1	4.3	15.8	6.7	9.9	10.3	9.2	

CV 7 7 4 13 3 5 3 6%



Results

Criterion Validity

- Strong correlation ($r = 0.897$; Hopkins, 2000) between Smart-jump and force plate.

Relative Reliability

- Strong correlation ($r = 0.782$) between test and re-test separated by 1 week.



Conclusions

- Three factors that need to be ensured when selecting a test protocol: (1) **Validity**, (2) **Reliability**, and (3) **Sensitivity** (Currell & Jeukendrup, 2008).
- Most important finding of present study was **sensitivity** (CV) of **6%** - below 10% cut-off used to determine test reliability (Cormack *et al.*, 2008).
- Higher sensitivity in the present protocol compared to Lloyd *et al.* (2009) can be attributed to the **elimination of the lowest 5 jump heights** that are likely to have been a result of deficiencies in postural control.
- Another important finding was that the **ten to five RJT** was found to gain **consistent scores** after just **2 trials**.
- **Strong correlation for test-retest**



Implications

- **Mobile contact mat** used in the present study was shown to have a high level of criterion validity in agreement with Lloyd et al. (2009).
- Previous studies suggest **jump height** seems to be best choice and calculation of RSI offers little advantage (Holm *et al.*, 2008).
- **10 to 5 RJT** can provide a **quick and reliable** means of **monitoring** individual progress and **evaluating** the success of interventions aimed at developing the **reactive strength** capabilities (fast SSC).
- Future work needs to **examine relationships** of 10 to 5 RJT with measures of power, strength and speed for different sports.
- Variations in 10 to 5 RJT for e.g. **single leg** and **'tuck' jump**.



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